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pebbles, etc., the same type of soil by the way chosen by the European and South American species assigned to *Aschisma*. Hall appears to have noted it in more than one place. His original material is now represented in this country by a specimen at the New York Botanical Garden which had been sent to Austin by Lesquereux, and by specimens in the Sullivant and James herbaria at Harvard University. Professor Farlow has kindly furnished me the following from a letter from Lesquereux found with the Sullivant specimen, dated Jan. 1, 1872, the words being quoted by Lesquereux from a letter from Hall: " I am interested in this little moss from the flint pebbles in the Kansas prairies. It grows also a thick leathery confervoid stratum* and is remarkable for affecting only flint pebbles or small flint rocks at their base, forming a thallus or coat frequently all around the stones below."

ITHACA, N. Y.

DESCRIPTION OF A NEW FOSSIL FERN FROM THE JUDITH RIVER FORMATION OF MONTANA†

BY F. H. KNOWLTON

Fossil ferns in a fruiting condition are of such comparatively rare occurrence that the finding of a new one is still worthy to record, and this is the warrant for the present brief notice. The material which has furnished the basis for the following diagnosis was obtained the past season (1914) by Mr. E. Russell Lloyd, of the U. S. Geological Survey, in the so-called Judith coal field of Montana. These specimens are so fragmentary that they would hardly be worthy of more than passing notice if it was not for the fact that the fruit is preserved in such a high degree of perfection. The form may be known as:



FIG. 1. *Dryopteris Lloydii*, sterile pinnule, $\times 3$

* The protonema.

† Published with the permission of the Director of the U. S. Geological Survey.

***Dryopteris Lloydii* n. sp.**

Diagnosis.—Outline of whole frond unknown; pinnae rather thick and firm in texture, narrowly linear, acute, cut nearly to the rachis into numerous alternate, deltoid, obtuse pinnules; fertile pinnae slightly smaller than the sterile pinnae; nervation consisting of a rather strong slightly flexuose midvein and some three or four pairs of slender, once-forked veins; fertile pinnae small; sori relatively very large, 3 or 4 to each pinnule and nearly covering it; indusium centrally peltate; sporangia evidently of large size, producing pits in the leaf substance, the pits disposed more or less clearly in three circles, the outer circle with about 15, the middle circle with 7 or 8 and the inner a cluster of about 5.

Types.—U. S. National Museum, Nos. 34,970, 34,971, 34,972.

Locality.—Near mouth of Judith River, Fergus County, Montana (NW $\frac{1}{4}$ Sec. 17, T 23 N, R 16 E.).

Horizon.—Judith River formation (Montana group, Cretaceous). Probably between 30 and 50 feet above the base of the formation.

This interesting little species is represented by several detached pinnae only, and hence it is impossible to determine the shape of the whole frond, though it was presumably at least bipinnatifid. There is evidence of slight dimorphism, the fertile pinnae being a little smaller than the sterile ones, and with the pinnules more rounded or obtuse at apex. The nervation, which is obscure on account of the thick substance of the frond, consists of a relatively strong midvein and three or four pairs of once-forking veins at a low angle of emergence.

The fertile pinnae are 3 or 4 cm. in length and about 5 or 6 mm. in width. They are cut nearly to the rachis into numerous deltoid almost moniliform pinnules which are only about 3 mm. long and 2 mm. broad at the base. The fruit dots are usually 4 though sometimes only 3 in number, and are relatively of such large size that they almost completely cover the pinnule; the diameter of the sori is about 1 mm.; while the indusium is rarely preserved there is fortunately one which is practically complete showing that it was centrally peltate. When the material is freshly opened each sorus is filled with a carbonaceous mass nearly .5 mm. thick which probably represents the mass of sporangia, though they cannot now be made out. When this

carbonaceous mass is removed there is revealed a series of little pits in the substance of the pinnule that represent the impress of the sporangia. These pits are disposed in circles.

The specimens which furnish the basis for this species have been shown to Mr. Wm. R. Maxon, of the U. S. National Museum, and he pronounces them as without doubt dryopteroid. This

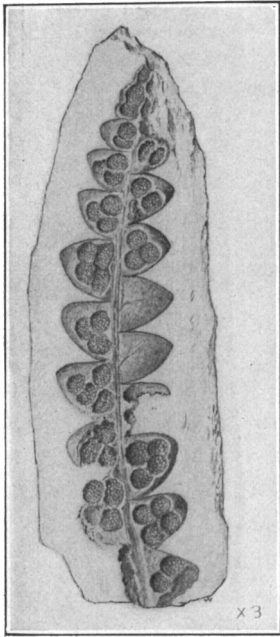


FIG. 2. *Dryopteris Lloydii*, fertile pinnule, $\times 3$.

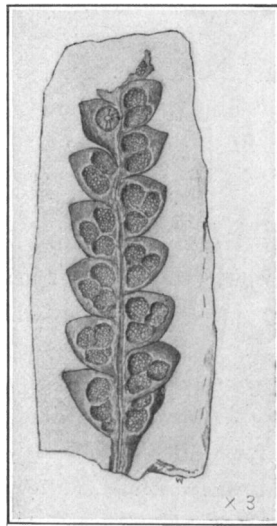


FIG. 3. *Dryopteris Lloydii*, fertile pinnule, $\times 3$.

species has a more or less remote resemblance to several living species, but so little is known of its whole form that it would be perhaps misleading to signal any one for direct comparison.

Among fossil forms the species here described is undoubtedly very closely related to *Aspidium fecundum* Heer* (or *Dryopteris fecunda* as it should now be called) from the Atane beds of Greenland. The latter species, however, is considerably larger, with the pinnae cut to the rachis into oblong, rounded pinnules. The

* Heer, Oswald, Den ersten Theil der fossilen Flora Grönlands: Flora fossilis arctica, Vol. 6, Pt. 2, 1882, p. 32, pl. xxix, figs. 5-9.

sori are from 4 to 6 in number and do not so nearly cover the whole area of the pinnule as in *Dryopteris Lloydii*. The pits left

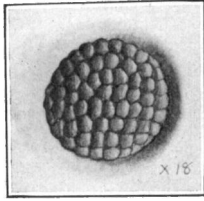


Fig. 4. *Dryopteris Lloydii*, sori, $\times 18$.

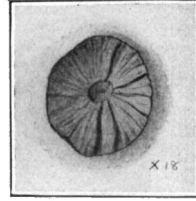


FIG. 5. *Dryopteris Lloydii*, indusium, $\times 18$.

by the sporangia are similar in character in the two species, though not quite so numerous in the Greenland form.

SHORTER NOTES

THE HELIANTHOID GENUS *TONALANTHUS*.—Among the plants gathered by Dr. Purpus in 1913 in the state of Chiapas, Mexico, was a very interesting new Helianthoid genus, described by Mr. T. S. Brandege* as *Tonalanthus*. The single species, *T. aurantiacus* Brandege, was collected on the Sierra de Tonalá. The rather brief Latin description, while adequate for recognition, does not readily enable one to fully appreciate the characters of the plant, so I offer some figures and notes, based on fragments of the type lot, very kindly communicated by Mr. Brandege.

Involucral bracts, at least the outer ones, about 15 mm. long and 4.5 broad, parallel sided except apically; coriaceous, the basal half whitish, the apical reddish-brown; about a dozen parallel veins; dorsal surface of apical part furfuraceous, and margin very briefly, inconspicuously ciliate (fig. G).

Receptacle, "long, like *Lepachys*" (Brandege litt.).

Disc bracts elongate, hyaline, divided apically into about three slender, sharp-pointed lobes, one much longer than the others (fig. C).

Achenes narrow, flattened, the surface, except the margins, strongly furfuraceous. Achenes about 4 mm. long, the pappus scales distinctly, but not greatly, longer (fig. A).

* Univ. Calif. Publ., Botany, VI, 75, Aug. 3, 1914.